

ATTACHMENT B

Report:

The Economics of Wholesale Roaming in CMRS Markets

R. Preston McAfee

THE ECONOMICS OF WHOLESALE ROAMING IN CMRS MARKETS

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I. Introduction

The Federal Communications Commission (“the Commission”) has issued a Memorandum Opinion and Order and Notice of Proposed Rule Making (“MOO” and “NPRM”) reviewing the need for continuing manual roaming requirements and for imposing an automatic roaming requirement. It has been several years since the Commission has revised roaming requirements, and the Commercial Mobile Radio Services (“CMRS”) market has experienced significant consolidation as well as entry of some regional operators. These factors justify an MOO/NPRM on roaming.

The CMRS industry is dominated by four large nationwide operators controlling a large share of available CMRS spectrum. These firms have begun using anti-competitive pricing policies in the wholesale market, apparently to limit the ability of smaller and more innovative carriers to enter and expand. Section 201(b) of the Telecommunications Act (“the Act”) requires that “[a]ll charges, practices, classifications, and regulations for and in connection with [common carrier] service be just and reasonable,” and that “any such charge, practice, classification, or regulation that is unjust or unreasonable is...unlawful.”¹ However, existing regulations and policy guidelines have not impeded the spread of exclusionary wholesale roaming pricing practices and refusals to deal.

Competition for *retail* CMRS services appears vigorous. The Commission stated in its *Tenth Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services* that “[e]ven with fewer nationwide mobile telephone carriers to choose from, U.S. consumers continue to benefit from robust competition in

¹ Telecommunications Act of 1996, Pub. LA. No. 104-104, 110 Stat. 56 (1996), at p. 35.

the CMRS marketplace.”² In contrast, the competition in wholesale markets for roaming services is much less robust. The main reason for the difference is that distinct technologies, such as iDEN, CDMA, and GSM, compete head-on for retail consumers and may or may not be substitutes for consumers’ needs. However, in wholesale markets, these distinct technologies are not substitutes, and this fact limits a carrier’s options for roaming services. This situation is especially true for iDEN where, in almost all markets, SouthernLINC Wireless has only one potential supplier of wholesale roaming services. Similarly, there is now only one nationwide WCDMA network.³ Wholesale competition is also limited for CDMA and GSM. For most technologies and geographic areas, regional CMRS providers have only one or two options for wholesale roaming services.

The nationwide carriers are using their market power to foreclose competition from regional carriers. As this report will demonstrate, Sprint/Nextel and its partially owned affiliate, Nextel Partners,⁴ has used its market power to reduce the competitiveness of SouthernLINC Wireless and other iDEN providers by increasing charges for roaming services. Sprint/Nextel charges SouthernLINC Wireless excessive and anti-competitive roaming charges, reportedly in excess of retail rates.⁵ Worse still, Nextel Partners has not offered SouthernLINC Wireless wholesale roaming at prices at

² Federal Communications Commission’s *Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, Tenth Report* (hereafter “*Tenth Annual Report*”), at ¶204.

³ Until more spectrum is released, it is unlikely that anyone other than Cingular will have the spectrum available to deploy WCDMA except on a limited regional basis. The minimum sized carrier channel for WCDMA is 10 MHz, and generally 20 MHz, or two carrier channels, is regarded as the minimum amount of spectrum to offer seamless coverage.

⁴ Sprint/Nextel is in the process of completing its acquisition of Nextel partners.

⁵ See *In the Matter of Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers WT-Docket No. 05-265*, Comments of SouthernLINC Wireless, at 12-13 and Attachment A.

levels that could be of any benefit to SouthernLINC Wireless's retail customers⁶. As a result, SouthernLINC Wireless can only offer its customers limited roaming coverage outside the region in which it has spectrum. Other large carriers also charge other small or regional CDMA or GSM regional carriers wholesale rates that exceed average retail rates for comparable service.⁷

Anti-competitive pricing of wholesale roaming harms consumers. Such pricing forces actual and potential SouthernLINC Wireless customers—and customers of other regional CMRS providers—to choose between nationwide carriers and regional carriers with limited roaming. This adversely affects consumers in spite of nationwide retail competition because regional carriers offer differentiated, specialized, or innovative services, and may offer better local service coverage as well. Anti-competitive pricing of wholesale roaming needlessly restricts customer choices and creates unnecessary artificial impediments for entry of new carriers.

Current roaming regulations and policies toward “unjust and unreasonable” and “unlawful” charges do not provide small and regional carriers with a practical option for obtaining wholesale contracts for nationwide roaming services. Unaffiliated regional carriers are thereby precluded from competing for customers who would otherwise purchase their services. To ensure compliance with the mandate of the Act, the Commission should define standards for just and reasonable wholesale roaming charges. This issue is a potentially complex one, but the existence of retail competition provides a very straightforward means of limiting the exercise of market power at the wholesale

⁶ SouthernLINC Comments at 12-13 and Attachment A.

⁷ See, e.g., Leap Wireless International, Inc. (Leap Wireless), WT Docket No. 00-193, *Ex Parte*, filed July 12, 2005; See also Leap Wireless *Ex Parte*, filed August 17, 2005.

level. Quite simply, a carrier's wholesale roaming rates in a region should not exceed its lowest prevailing retail rates in that region.

The Commission should also impose a requirement that any facilities-based operator in a region provide automatic roaming under just and reasonable conditions to all other carriers using compatible technologies who do not have access to spectrum in that region. Together, these two requirements represent a minimally intrusive way for the Commission to ensure that the nationwide carriers do not squeeze smaller or regional carriers.

The next section describes competition in wholesale and retail markets. In particular, it identifies at least three distinct wholesale markets in each license area. The data presented in the next section show that in almost all markets there is a monopoly provider of wholesale iDEN services. The section also shows that, in most regions, there is a duopoly for wholesale service in at least one of the two other main digital CMRS technologies, CDMA and GSM.

In Section 3, this paper provides an analysis of the economic incentives for a nationwide CMRS operator, such as Sprint/Nextel, to offer wholesale services to firms that compete with it for subscribers in a limited geographic market. Section 3 explains why Sprint/Nextel and Nextel Partners have set roaming rates so high as to foreclose competition from regional iDEN suppliers for all but those consumers who have no interest in roaming. The analysis explains why this anti-competitive pricing of wholesale roaming is likely to persist even after integration of Nextel Partners into Sprint/Nextel, as well as why for other technologies, such as WCDMA, there is a single nationwide provider of wholesale roaming. This section also explains why, absent Commission

intervention, these foreclosure incentives are likely to apply when there is a duopoly in the provision of wholesale roaming services, as is the case for iDEN in very few cellular market areas (“CMAs”) or basic trading areas (“BTAs”), and is the case for CDMA and GSM operators in a great many BTAs and CMAs.

Section 4 describes some of the innovative services offered by regional carriers that are not available from nationwide carriers and explains the adverse effects of the current anti-competitive roaming pricing practices on consumers. Section 5 proposes the two recommended policies described above and considers the ease of implementation, regulatory burden, and likelihood of ending anti-competitive pricing practices.

II. Wholesale and Retail CMRS Markets Structure and Pricing Practices

The retail Commercial Mobile Radio Service (“CMRS”) market is now dominated by four nationwide carriers: Cingular, Sprint/Nextel, T-Mobile and Verizon Wireless. The four operators deploy a combination of six technologies: Cingular offers AMPS, TDMA, GSM and WCDMA; Sprint/Nextel offers CDMA and iDEN; T-Mobile offers GSM; and Verizon Wireless offers AMPS and CDMA. Two technologies, analog AMPS and TDMA, are gradually being supplanted by newer digital technologies.⁸ Carriers using the different technologies compete directly in retail markets but do not compete in wholesale markets.

Carriers offer differentiated retail products, especially across technologies. iDEN network operators have long had an advantage in offering a dispatch, push-to-talk

⁸ In recognition of this, the Commission no longer distinguishes TDMA from GSM technology. See *Tenth Annual Report*, ¶ 110. Also, AMPS remains in use in rural areas and on a decreasing amount of spectrum in urban areas.

technology. GSM provides better international roaming capabilities and was the first technology to offer Short Messaging Service (SMS). CDMA has enjoyed advantages in higher data rates and data capabilities, as well as in allowing network operators to serve more subscribers on a given amount of spectrum.

The different technologies are incompatible in that mobile subscribers using one digital technology cannot roam on the network of an operator using a different digital technology.⁹ Although these technologies compete for retail customers, the wholesale market for roaming services for each technology is a separate market because neither regional operators nor their subscribers have any ability to substitute. In addition, each geographic area is a separate market because wholesale minutes available in one region cannot be substituted for those in a different region. Moreover, retail minutes cannot be resold, which means that a nationwide carrier has the ability to charge more for wholesale roaming minutes than it charges its retail customers.

In many regions, the wholesale market for CMRS roaming services is not very competitive for any technology. This situation is especially true for iDEN, for which there is just one large nationwide iDEN operator (Sprint/Nextel, and its partially owned affiliate, Nextel Partners), SouthernLINC Wireless and a few other, small regional iDEN operators.¹⁰ As a result of this market concentration, in most markets SouthernLINC Wireless can only purchase wholesale roaming from Sprint/Nextel or its affiliate Nextel

⁹ There are a few exceptions. One exception is that Cingular's WCDMA subscribers may be able to roam on a T-Mobile network as WCDMA terminals also often dual-mode, i.e., designed to operate on GSM networks. Another is that there were, at one point, a large variety of dual mode analog-digital handsets. The share of dual mode handsets sold each year is rapidly declining.

¹⁰ Airpeak is probably the largest other firm using iDEN that connects to the PSTN. A few years ago, Mobex and Chadmoore also offered iDEN service. However, Mobex stopped operating in the 800 MHz bands (see <http://www.mobex.com/pressreleases/19-RCR%20Article%203-22-04.htm>) and Chadmoore was acquired by Nextel (see <http://www.fcc.gov/transaction/nextel-chadmoore.html>).

Partners.¹¹ Nextel Partners' pricing offer has been at such a high rate that it is tantamount to a refusal to negotiate. Moreover, in the areas Sprint/Nextel serves, they apparently charge SouthernLINC Wireless excessive rates for roaming, so high that SouthernLINC Wireless would greatly prefer the rates Sprint/Nextel offers individual retail customers over what it currently has to pay. It is not uncommon for large or nationwide carriers to charge unaffiliated carriers much more per minute for wholesale roaming than they charge retail customers, in spite of the fact that the nationwide carriers do not need to recoup gross customer acquisition costs, customer care costs, and billing costs from wholesale roaming as they do from retail roaming revenues.¹² These customer costs can be significant.¹³ Other regional carriers have also indicated that they find the wholesale rates that nationwide carriers charge to be excessive.¹⁴

¹¹ See SouthernLINC Comments at 11-14. and Attachment A. Airpeak has some coverage in approximately half a dozen markets, the largest of which is Las Vegas, NV.

¹² Data on specific roaming agreements is generally confidential. However, there are a few reports of large carriers charging setting wholesale roaming rates for unaffiliated small or regional carriers in excess of 30¢ per minute even though they may charge affiliates less than 10¢ per minute. (see <http://64.226.207.204/BTU042804.PDF>). SouthernLINC Wireless has stated that they pay wholesale rates which are substantially higher than Nextel's retail rates. (See SouthernLINC Comments at 13) Also, Leap has stated it has "had difficulty negotiating reasonable, or even viable" wholesale rates. See Leap Wireless *Ex Parte*, filed August 17, 2005

¹³ One report indicated customer acquisition costs of \$300-400 (<http://www.wirelessweek.com/article/CA237028.html?spacedesc=Business%2FFinance>). A \$350 customer acquisition cost coupled with churn of 1.5 to over 3% can mean that customer acquisition costs alone can account for between \$8 and \$13 or more per month from an average revenue per user of approximately a bit less than \$49 for Cingular to over \$60 for Sprint/Nextel. See http://www.boozallen.de/content/downloads/insights/5J_Winningt.pdf. Suncom reported these costs as \$453 (http://www.eet.com/press_releases/prnewswire/showPressRelease.jhtml?articleID=X390968&CompanyId=1). Western Wireless reported these costs as \$353 (<http://biz.yahoo.com/e/050506/wwca10-q.html>).

¹⁴ Cf. 6.

TABLE 1
POST-PAY RATES AND NET REVENUES PER MINUTE¹⁵

	VZW		Cingular		Sprint		T-Mobile	
Included anytime minutes	900	6000	900	6000	1000	2000	600	5000
Monthly charge	\$60	\$200	\$60	\$200	\$56	\$100	\$40	\$130
Gross revenues per minute	\$0.15	\$0.03	\$0.15	\$0.03	\$0.056	\$0.05	\$0.15	\$0.026

Table 1 provides a summary of retail offerings of the four nationwide carriers. It includes monthly costs for an average consumer, who, according to the *Tenth Annual Report*, uses 584 minutes a month, and for the lowest per minute rate plan posted by each carrier.

Table 1 only presents gross revenues per minute. These gross revenues will necessarily provide a margin to recover customer acquisition costs, billing, and customer care. These are all costs that the nationwide operators must incur for retail subscribers that they do not incur for wholesale minutes.¹⁶ Assuming \$350 customer acquisition

¹⁵ Cingular rates were obtained from <http://onlinestorez.cingular.com/cell-phone-service/wireless-phone-plans/cell-phone-plans.jsp;dsessionid=Q01BPSSECCR5TB4ROEUCFFA?pflow=a>; Verizon Wireless rates were obtained http://www.verizonwireless.com/b2c/store/controller?item=planFirst&action=viewPlanDetail&sortOption=priceSort&catID=323&cm_re=Home%20Page-_Personal%20Box-_Individual%20Plans; Nextel rates are from http://nextelonline.nextel.com/NASApp/onlinestore/en/Action/DisplayPlans?audience=INDIVIDUAL&id12=Personal_Wireless;Plans_Coverage&language=EN; T-Mobile rates are from <http://www.t-mobile.com/plans/?tab=nationwide>.

¹⁶ At 3% monthly churn amortized customer acquisition costs are over \$12 per month. Cf 11 above. Churn rates for Verizon Wireless were 1.3% in 3Q 2005 (see <http://investor.verizon.com/financial/quarterly/VZ/3Q2005/>), 2.3% for Cingular in 3Q 2005 (see <http://investor.verizon.com/financial/quarterly/VZ/3Q2005/>), 2.1% for post-paid and 4.9% for pre-paid subscribers for Sprint/Nextel during 3Q 2005 (see

costs, a 10% interest rate, and a 1.5% monthly churn rate, the amortized cost of churn means that an operator must incur almost \$8 per month for retail customer acquisition costs alone that the operator does not need to incur for wholesale minutes. Even for nationwide operators with churn as low as 1.5%, this means that, for an average consumer who uses 584 minutes per month, net revenues per minute must be at least 1.37¢ per minute less than average gross revenues, and almost 2¢ per minute if the churn is as high as 2.5%. Billing and customer support are additional costs of retail service that are not incurred for wholesale service.

Wholesale markets for CDMA and GSM roaming are only slightly less concentrated than the wholesale iDEN market in most regions. While Table 2 derived from the *Tenth Annual Report* shows the presence of five or more CMRS providers in counties covering over 87% of the U.S. population, the options for wholesale roaming for CDMA and GSM operators are more limited.

TABLE 2
MARKET ENTRY OVER TIME¹⁷

Total Number of Providers in a County	Percent of Total US POPs Covered					
	Tenth Report	Ninth Report	Eighth Report	Seventh Report	Sixth Report	Fifth Report
1 or 2	3.10%	3.20%	5.30%	5.90%	9.20%	12.20%
3	3.70%	3.80%	5.40%	5.40%	6.40%	8.00%
4	5.90%	5.50%	6.70%	8.30%	9.30%	11.30%

<http://www.sprint.com/investors/earnings/qe/3q05.pdf>) and 2.8% for T-Mobile during 2Q 2005 (see http://www.t-mobile.com/company/investors/financial_releases/2005_Q2.pdf).

¹⁷ *Tenth Annual Report*, at 89, Appendix A, Table 9.

5	46.00%	11.70%	11.50%	27.30%	28.40%	33.90%
6	28.70%	46.30%	45.70%	31.90%	34.80%	30.20%
7 or more	12.60%	29.50%	25.40%	21.20%	11.90%	4.40%

Table 3 describes the market structure for wholesale roaming for CDMA, GSM and iDEN in the 50 largest BTAs. Table 3 differs from Table 2 in that it divides the set of potential suppliers for wholesale roaming into different markets for each CMRS technology. Within each technology, Table 3 provides a tally of the number of operators that currently have facilities and are using those facilities to serve end users.

In only two of the 50 BTAs are there three or more CDMA network operators and three or more GSM network operators. As is explained in more detail in the next section, these monopoly and duopoly providers of wholesale roaming have strong economic incentives, as well as the ability, to foreclose regional operators.

TABLE 3
WHOLESALE ROAMING MARKET STRUCTURE IN THE FIFTY LARGEST BTAs

Numbers of carriers in 50 largest BTAs using technology	1	2	3	4+
GSM	0%	94%	6%	0%
CDMA	0%	46%	36%	18%
iDEN	100%	0%	0%	0%

III. An Economic Analysis of Vertical Foreclosure in Wholesale CMRS Markets

This section describes the economics behind the foreclosure incentives of the nationwide operators. To identify the foreclosure incentives of a nationwide operator with a monopoly in provision of wholesale roaming competing with a regional operator who is dependent on that nationwide operator for roaming, it suffices to consider a few factors.¹⁸

A nationwide carrier may have an incentive to increase roaming rates beyond not just the competitive level, but beyond the monopoly level, for two reasons. First, retail competition forces the nationwide carriers' retail rates to be far less than the monopoly level. But for a regional carrier's subscribers, the nationwide carrier can charge what the market will bear, and would raise the roaming rate to the monopoly level. A regional carrier has little bargaining power, since the value of roaming on the nationwide carrier's subscribers is modest. Second, the nationwide carrier hobbles the regional carrier by setting high roaming rates, thereby increasing the nationwide carrier's subscriber base. This effect tends to push the roaming rates even beyond monopoly prices and, in particular, well beyond the retail levels, which is consistent with the actual observed practice.

The potential loss of roaming revenues from higher roaming rates can, in theory, deter a nationwide operator from foreclosing the regional carrier, depending on the ability of the regional carrier to survive a refusal to deal. However, for potential lost roaming

¹⁸ One model that provides an analysis of foreclosure incentives in a similar situation is that of Chen and Riordan (2004). Their paper assumes duopolies in each of two markets (or regions). If one duopolist is integrated across the two regions, then it will want to integrate with the other duopolist in one market (region). See Yongmin Chen and Michael H. Riordan, *Vertical Integration, Exclusive Dealing, and Ex Post Cartelization*, 2004 available at <http://www.columbia.edu/~mhr21/Research.htm>.

revenues to limit roaming rates, it must be the case that there is some level of wholesale roaming rates for which the cost of decreased roaming use and roaming revenues from higher roaming rates offsets the benefits of increased market share in the non-roaming market. When retail prices are relatively high, the benefit from hobbling the regional carrier in the competition for new customers will tend to outweigh the benefit from roaming sales, and conversely.

Indeed, due to its limited footprint, a regional operator is unlikely to attract customers who roam a great deal. In addition, for an iDEN operator, the effect of increased competition is possibly quite significant; Nextel/Sprint maintains significantly higher revenues per subscriber than other CMRS carriers typically collect.¹⁹ Offering roaming to a rival regional iDEN operator can result in reduced margins from iDEN service for Sprint/Nextel and Nextel Partners.

Even where there is a duopoly in the provision of wholesale roaming for a technology in a region, the same considerations will apply. Neither duopolist will want to be the first to offer wholesale roaming to regional operators. These foreclosure incentives have become stronger with consolidation of CMRS operators and are the reason why the Commission should intervene to mandate automatic roaming under just and reasonable terms.

¹⁹ Average revenues per subscriber or user ("ARPU") are reported in quarterly and annual financial statements for all the nationwide CMRS operators. Sprint/Nextel's are \$62 per subscriber <http://www.sprint.com/investors/earnings/qe/3q05.pdf>, Cingular reported ARPU of \$49.65 (<http://www.cingular.com/investors>), Verizonwireless reported ARPU of \$50.13 (http://news.vzw.com/investor/pdf/Cellco_10Q11.8.05.pdf) and T-Mobile reported ARPU of \$54 (http://www.t-mobile.com/company/investors/financial_releases/2005_Q2.pdf).

IV. Adverse Effects of Anti-Competitive Pricing for Roaming.

The fact that wholesale markets for roaming services may not be at all competitive for many technologies in many regions does not always imply there is any need for regulatory intervention if the retail market is highly competitive. Limited competition in wholesale markets may not limit competition in downstream retail markets when there are many technologies with similar capabilities, and control of the networks is dispersed across a number of firms. The above-scenario does not describe today's CMRS market, though. There are only four nationwide firms operating a total of six digital networks - two of the firms operate multiple digital technology networks. In addition, the data indicate that there are on average about 4.5 facilities-based operators in the 50 largest BTAs. The lack of wholesale competition handicaps the regional firms and limits options available to consumers. Regional firms make a difference by offering new and innovative services, often unavailable from some or all of the nationwide operators and by often offering them earlier.

SouthernLINC Wireless competes with all CMRS operators for voice service, but primarily with Sprint/Nextel or Nextel Partners for dispatch service.²⁰ Two network features that SouthernLINC Wireless promotes are better coverage in rural areas and better reliability. SouthernLINC Wireless's network was the only network in the path of hurricanes Katrina and Rita to largely survive and was the first fully restored to service.²¹ Given the fact that all other CMRS operators in a large fraction of the SouthernLINC

²⁰ CDMA operators now provide a dispatch service, although it is reportedly has different call set-up features, and has not yet had much success. See http://www.findarticles.com/p/articles/mi_m0GTV/is_5_22/ai_n13787936..

²¹ See SouthernLINC Comments at 22-23.

Wireless footprint suffered from significant disruptions during the past year due to hurricanes, it is not difficult to appreciate why SouthernLINC Wireless's service appeals to subscribers that want and need reliable service. In addition, SouthernLINC Wireless offers more extensive local coverage, which gives it another advantage in competing with the nationwide carriers.

Actual and potential customers of other regional operators using other technologies face similar dilemmas in other regions. For instance, at least two regional CDMA carriers, Leap Wireless and MetroPCS, offer unlimited local calling for a flat monthly rate of \$30 and will add unlimited long distance for \$40.²² These carriers can manage customer accounts so that customers do not need to apply for credit. As a result, these carriers appeal to customers who could not otherwise afford or qualify for mobile phone service or even regular landline phone service. None of the nationwide carriers offers comparable plans. Both Leap and Metro have been hampered in their ability to provide roaming.

Another regional operator that had innovative offerings, and whose customers would benefit from more affordable roaming, is Western Wireless.²³ Western Wireless was the first wireless carrier to be designated an "Eligible Telecommunications Carrier" for receiving support from state public utility commissions and from the Federal State Joint Board on Universal Service.²⁴ These services benefit customers who would not otherwise have any wireline or wireless service; current policy toward roaming makes roaming unavailable or unaffordable for such customers.

²² See www.cricketcommunications.com and www.metropcs.com

²³ Western Wireless was recently acquired by Alltel.

²⁴ <http://www.wwireless.com/PressRoom/30-Sep-1999.asp>

Consumers who obtain service from regional carriers, and those who currently do not because of limited roaming, would benefit from Commission enforcement of a mandatory automatic roaming requirement; SouthernLINC Wireless customers would not have to choose between reliable service and nationwide coverage, and customers of Leap, Metro, and other regional operators would be able to qualify for service that includes affordable roaming.

V. Conclusions and Recommendations

Wholesale markets for CMRS roaming services are in many places monopolies or duopolies. The four nationwide carriers, who are the monopoly and duopoly wholesale providers, employ anti-competitive pricing policies, often charging wholesale per minute rates significantly more than they charge their own retail customers. These practices occur despite the fact that, on average, wholesale minutes are less costly for carriers to provide. Such practices are clearly carried out with the intent of restricting output and raising costs of unaffiliated regional competitors. Some consumers are harmed by these wholesale practices, as regional providers offer services, features, and rate plans not offered by the nationwide operators. Current wholesale pricing practices of the nationwide carriers make actual and potential customers of those regional carriers choose between those services and roaming.

This issue is a complex one, but the existence of retail competition provides a straightforward means of limiting the exercise of market power at the wholesale level. A nationwide CMRS carrier should not be permitted to set wholesale roaming rates in any region which exceed that carrier's lowest prevailing retail rates in that region. This type of regulatory intervention would be unnecessary if the regional operators could arbitrage

the retail-wholesale price differences, purchasing the minutes under retail pricing plans and reselling rather than relying on the wholesale markets. Unfortunately, CMRS technology does not allow such resale.

The Commission should also impose a requirement that any facilities-based operator in a region provide automatic roaming under just and reasonable conditions to all other carriers using compatible technology. The Commission also needs to enforce this requirement—except in the minority of regional wholesale markets where there are three or more facilities-based operators who can provide service compatible with a given technology; the Commission should not place the enforcement burden totally on costly, and drawn out, complaint processes which are inaccessible to all but very large carriers.

Together, these requirements represent a minimally intrusive way for the Commission to ensure that the nationwide carriers do not squeeze smaller or regional carriers. This proposed limit on wholesale rates would not require Commission audit of CMRS carrier rates, nor would the Commission need to obtain and analyze possibly confidential cost information. The information needed to enforce this requirement is available from the carrier's rates posted online and in their financial statements. A regional carrier being required to pay wholesale rates in excess of the providers' prevailing retail rates can easily provide verifiable information to the Commission.

These requirements also do not prevent the nationwide carriers from earning reasonable return from their investment in their networks. The requirement that the wholesale rates not exceed retail rates only limits the ability of nationwide carriers to exercise market power to earn excess returns and to undermine competition.

The data in Table 1 above shows how straightforward the calculation of rates should be. This data is all obtained from the carrier websites. The lowest per-minute costs from available retail rates range from \$0.026 for T-Mobile to \$0.05 for Sprint/Nextel. All include unlimited long-distance. While average revenue per minute from all customers may exceed these average rates, due in part to unused minutes or additional charges for extra minutes or features, these rates do indicate the prices that the nationwide carriers are voluntarily willing to offer. In the case of Sprint/Nextel, which has a “fair and flexible” plan, and Cingular, which allows “roll-over” minutes, the average rates and marginal rates are almost the same. To maximize yield, it is also optimal for the carriers to set marginal rates for the largest individual customers close to the marginal costs of the airtime. These marginal costs are what the carriers should be charging for wholesale rates and represent the opportunity cost of the capacity.

The requirement that wholesale rates not exceed retail rates does not ensure that wholesale rates will be set at socially optimal levels. However, implementation of the proposed cap would be a substantial improvement in the wholesale rates available to many regional carriers and would mitigate much of the harm of the current wholesale pricing practices without a significant regulatory burden.

R. PRESTON MCAFEE

R. Preston McAfee is the J. Stanley Johnson Professor of Business Economics and Management at the California Institute of Technology. Professor McAfee's professional interests have focused on industrial organization, particularly with regard to antitrust, pricing, bidding and auction design, and the development of markets to improve the efficiency of procurement and administration in government and the private sector. He has authored more than sixty scholarly articles on these subjects and is author of *Competitive Solutions: The Strategist's Toolkit*, Princeton University Press. He has consulted extensively for firms and government agencies, both in the United States and abroad, on such matters as mergers, collusion, price-fixing, electricity pricing, auction design and bidding, and sales of government property. He has testified in federal district courts on antitrust and merger issues, and recently served as expert economist for the U.S. Department of Justice in *U.S. et al. v. Oracle* and for the Federal Trade Commission in the case of *Rambus, Inc.* He previously served as lead consultant to the FTC in the Commission's investigations of mergers between Exxon/Mobil and BP Amoco/ARCO, and in the Midwest Gasoline Price investigations. He previously served as Co-Editor of the *American Economic Review*, the preeminent economics journal, and currently is an Associate Editor of that journal and the *Journal of Economic Theory*. He is a Fellow of the Econometric Society. His areas of expertise include:

- Matters involving antitrust liability and damages, including monopolization claims, bundling and tying, vertical restrictions, and price fixing;
- Antitrust analyses including market definition and class certification;
- Studies of horizontal and vertical mergers to determine whether they would lead to the exercise of market power;
- Auction design and bidder support. Markets examined include microwave and PCS spectrum, mineral rights, and electric power;
- Privatization of government supplied-goods and services; and
- Applications of game theory in business strategy.

Professor McAfee received Ph.D. and M.S. degrees in economics and a M.S. degree in mathematics from Purdue University, and his B.A. in economics is from the University of Florida.

SELECTED CASEWORK

UNITED STATES DISTRICT COURT, NORTHERN DISTRICT OF CALIFORNIA SAN FRANCISCO DIVISION

United States of America, et al. v. Oracle Corporation

Lead consultant to U.S. Department of Justice. Prepared expert report and rebuttal report, and provided deposition and court testimony analyzing the likely competitive effects of Oracle's proposed acquisition of PeopleSoft, 2003-2004.

UNITED STATES DISTRICT COURT, FOR THE MIDDLE DISTRICT OF NORTH CAROLINA

D. Lamar DeLoach, et al. v. Philip Morris Companies, Inc., et al.

Prepared expert report and provided deposition testimony evaluating claims that major cigarette companies and leaf buyers engaged in a price-fixing agreement, 2003-2004.

FEDERAL TRADE COMMISSION

In the Matter of Rambus Inc.

Lead consultant to Federal Trade Commission. Prepared expert report and rebuttal report, and provided deposition and court testimony analyzing the competitive effects of Rambus's actions, 2003.

SUPERIOR COURT OF THE STATE OF CALIFORNIA, FOR THE COUNTY OF LOS ANGELES

Alan Wayne et al. v. BP Oil Supply Company, No. BC244334.

Economic analysis of petroleum prices, 2002.

FEDERAL TRADE COMMISSION

TMP Worldwide, Inc.'s (parent of Monster.com) proposed acquisition of HotJobs, Inc.

Consultant to Federal Trade Commission. Economic analysis of the competitive effects of the proposed merger, 2001-2002.

UNITED STATES DISTRICT COURT, NORTHERN DISTRICT OF OHIO

RE/MAX International, Inc., et al. v. Realty One, Inc., et al.

Prepared expert report and provided court testimony regarding economic analysis of price-fixing claims, 2000.



Litigation Consulting • Economics • Analysis • Support

2010-2011

FEDERAL TRADE COMMISSION

Exxon Corporation's proposed acquisition of Mobil Corporation.

Lead consultant to Federal Trade Commission. Economic analysis of the competitive effects of the proposed merger, 1999-2000.

FEDERAL TRADE COMMISSION

British Petroleum Corporation's proposed acquisition of Atlantic Richfield Corporation.

Lead consultant to Federal Trade Commission. Prepared expert report analyzing the competitive effects of the proposed merger, 1999-2000.

TEXAS STATE DISTRICT COURT, TRAVIS COUNTY, TEXAS

BMC Software, Inc. v. Peregrine/Bridge Transfer Corp., Skunkware, Inc, NEON Systems, Inc. Wayne E. Fisher, and John J. Moores v BMC Software, Inc. and Max P. Watson.

Prepared expert report and provided deposition testimony regarding product tying and predatory pricing claims, and analysis of damage claims, 1999.

FEDERAL ENERGY REGULATORY COMMISSION

Natural Regulation of Short-Term Gas Transportation Services, Docket No. RM98-10; Regulation of Interstate Natural Gas Transportation Services, Docket No. RM98-12.

Filed expert report with the Federal Energy Regulatory Commission analyzing the proposed auction of pipeline capacity, 1999.

FEDERAL COMMUNICATIONS COMMISSION

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Filed expert report with the Federal Communications Commission on auction design for the sale of spectrum license rights for wireless communications, 1993-1994.

UNITED STATES DISTRICT COURT, DISTRICT OF CONNECTICUT

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Deposition and court testimony regarding economic analysis of the proposed acquisition, 1989-1990.

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BOOK REVIEW

The Economics of Conformism, by Stephen Jones, reviewed for *The Canadian Journal of Economics*, February 1986.

Reprinted in *The Canadian Journal of Economics*, February, 1987.

ACADEMIC EXPERIENCE

J. Stanley Johnson Professor, California Institute of Technology, 2004-

Visiting Professor of Business Strategy, University of Chicago GSB, 2000-2001

Murray S. Johnson Chair, University of Texas at Austin, 1997-2003

Chair, Department of Economics, University of Texas at Austin, 1997-1998

Rex G. Baker, Jr., Professor of Political Economy, University of Texas at Austin, 1990-1997

Visiting Professor of Economics, Massachusetts Institute of Technology, 1994-1995

Professor of Economics, University of Western Ontario, 1989-1990

Visiting Professor of Economics, California Institute of Technology, 1989-1990

Visiting Associate Professor of Economics, California Institute of Technology, 1988-1989

Associate Professor of Economics, University of Western Ontario, 1987-1989

Assistant Professor of Economics, University of Western Ontario, 1981-1987

Visiting Assistant Professor of Economics, Purdue University, 1980-1981

EDITORIAL DUTIES

Co-Editor, *American Economic Review*, 1993-

Organized AEA session in honor of William Vickrey, 1992

Associate Editor, *American Economic Review*, 1992-1993

Associate Editor, *Journal of Economic Theory*, 1992-1996

Member of AEA, Society for the Promotion of Economic Theory, and Associate of American Bar Association

OTHER PROFESSIONAL ACTIVITIES

Market Design Inc., Vice-President and Treasurer

Colin Clark Lecture, Australasian Econometric Society Meetings, 1998

John S. Day Distinguished Alumni Award, Purdue's Krannert School of Management, 1997

Fellow (1995) and Member of the Econometric Society

Member of American Economic Association, Society for the Promotion of Economic Theory, and Associate of American Bar Association